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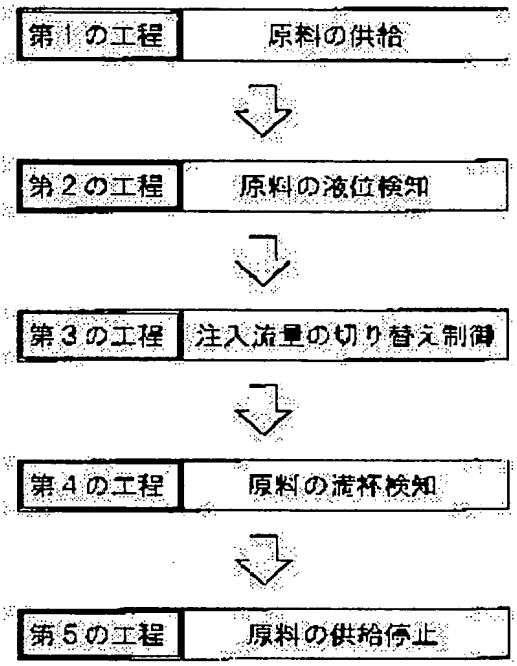
(54) METHOD AND APPARATUS FOR FILLING PLASTIC RAW MATERIAL

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a method and apparatus for filling a plastic raw material for solving the lowering of productivity caused by the reduction of a supply flow rate generated by the volume difference of a cavity and a rise in the viscosity of the plastic raw material in a cast molding method for a plastic product.
SOLUTION: A method for detecting the liquid level of the plastic raw material to change over an injection flow rate and a raw material supply method not affected by a change in viscosity are conceived. As a result, the changeover of a flow rate becomes possible at a predetermined height in all of molds and a filling time can be shortened to a large extent and productivity is enhanced. Further, since the plastic raw material is not pressed by compressed air, the generation of air bubble failure caused by the dissolution of air can be prevented.



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CLAIMS

[Claim(s)]

[Claim 1] The 1st process which supplies a plastics raw material in the cast-molding method of a plastic, The 3rd process which changes and controls the flow rate of the plastics raw material supplied based on the liquid level detected as the 2nd process which detects the liquid level of a plastics raw material, The restoration method of the plastics raw material characterized by the bird clapper from the 4th process which detects that the inside of a cavity fills with a plastics raw material, and the 5th process which stops supply of a plastics raw material after detecting ****.

[Claim 2] In the restoration method of a plastics raw material according to claim 1 the 2nd process of the above The beam of light which is the wavelength region where permeability is high, and includes the low wavelength region of permeability to a plastics raw material to the member which constitutes the mould for molding is irradiated at the mould for molding. The restoration method of the plastics raw material characterized by detecting the liquid level of a plastics raw material by detecting permeability change of the beam of light of the aforementioned wavelength region by the side which faces [irradiation and].

[Claim 3] It is the restoration method of the plastics raw material characterized by detecting quantity of light change produced in the boundary section of a plastics raw material and the air in a cavity, and detecting the liquid level of a plastics raw material when the 2nd process of the above irradiates a beam of light in the restoration method of a plastics raw material according to claim 1 at the mould for molding.

[Claim 4] It is the restoration method of the plastics raw material characterized by changing the height which detects the liquid level detection method of the 2nd process of the above according to the size of the mould for molding in the restoration method of a plastics raw material according to claim 2 or 3.

[Claim 5] The restoration method of the plastics raw material characterized by being the transparent body with which the member which constitutes the mould for molding and, by which a beam of light is irradiated in the restoration method of the plastics raw material of a claim 2-4 given in any 1 term lets the beam of light for detecting the liquid level of a plastics raw material pass, or the translucent body.

[Claim 6] It is the restoration method of the plastics raw material characterized by detecting the liquid level of the plastics raw material in a cavity through the member from which the 2nd process of the above constitutes the mould for molding in the restoration method of the plastics raw material of a claim 2-5 given in any 1 term.

[Claim 7] It is the restoration method of the plastics raw material characterized by changing the flow rate of the plastics raw material supplied after predetermined time progress after the 3rd process of the above detects liquid level as soon as the liquid level of a plastics raw material is detected at the 2nd process of the above or in the restoration method of the plastics raw material of a claim 1-6 given in any 1 term, and controlling.

[Claim 8] It is the restoration method of the plastics raw material characterized by changing and controlling the flow rate of the plastics raw material which the 1st process of the above supplies a plastics raw material with a roller pump, a gear pump, or a magnet pump, and the 3rd process of the above is controlling the rotational frequency of the motor for a drive of the aforementioned pump, and is supplied in the restoration method of the plastics raw material of a claim 1-7 given in any 1 term.

[Claim 9] It is the restoration method of the plastics raw material characterized by to change and control the flow rate of the plastics raw material which supplies a plastics raw material, and the 3rd process of the above is controlling the voltage or the frequency impressed to the piezoelectric device of the aforementioned pump, and is supplied by the pump which the 1st process of the above had a piezoelectric device, and was in the restoration method of the plastics raw material of a claim 1-7 given in any 1 term.
[Claim 10] It is the restoration method of the plastics raw material characterized by changing and controlling the flow rate of the plastics raw material which the 1st process of the above supplies a plastics raw material with a batching-by-volume formula pump, and the process of the above 3 is controlling the period of the plunger of the aforementioned pump of operation, and is supplied in the restoration method of the plastics raw material of a claim 1-7 given in any 1 term.
[Claim 11] The member which the aforementioned plastics raw material is a plastic-lens raw material in the restoration method of the plastics raw material of a claim 1-10 given in any 1 term, and constitutes the aforementioned mould for molding is the restoration method of the plastics raw material characterized by the bird clapper from the form block which specifies the field by the side of the body of an adhesive tape and a plastic lens, and the form block which specifies the field by the side of an eyeball.
[Claim 12] Cast-molding equipment of a plastic characterized by providing the following. A feeding means to supply a plastics raw material. A liquid level detection means to detect the liquid level of a plastics raw material. A control-of-flow means to change and control the flow rate of the plastics raw material supplied based on the detected liquid level. A full detection means to detect that the inside of a cavity fills with a plastics raw material, and a valve-opening close means to receive the signal from a full detection means and to stop supply of a plastics raw material.
[Claim 13] Restoration equipment of the plastics raw material according to claim 12 characterized by providing the following. The aforementioned liquid level detection means is a floodlighting means A to irradiate the beam of light which is the wavelength region where permeability is high, and includes the low wavelength region of permeability to a plastics raw material to the member which constitutes the mould for molding at the mould for molding. A light-receiving means A for it to be arranged at the side which faces the aforementioned floodlighting means A, and to detect light income change of the beam of light of the aforementioned wavelength region.
[Claim 14] It is restoration equipment of the plastics raw material characterized by having a light-receiving means B to detect the quantity of light change in the boundary section of a floodlighting means B by which the aforementioned liquid level detection means irradiates a beam of light to the mould for molding in the restoration equipment of a plastics raw material according to claim 12, a plastics raw material, and the air in a cavity.
[Claim 15] It is restoration equipment of the plastics raw material characterized by having the justification mechanism in which change ****** can do the height which detects the aforementioned liquid level detection means according to the size of the mould for molding in the restoration equipment of a plastics raw material according to claim 13 or 14.
[Claim 16] It is restoration equipment of the plastics raw material characterized by being arranged on the outside of the mould for molding so that the liquid level of the plastics raw material in a cavity can be detected through the member from which the aforementioned liquid level detection means constitutes the mould for molding in the restoration equipment of the plastics raw material of a claim 13-15 given in any 1 term.
[Claim 17] It is restoration equipment of the plastics raw material characterized by having the timer which is constituted so that the aforementioned control-of-flow means may change a flow rate in response to the detecting signal from the aforementioned liquid level detection means in the restoration equipment of the plastics raw material of a claim 12-16 given in any 1 term and it may control, and detects the predetermined time progress from liquid level detection of a plastics raw material.
[Claim 18] Restoration equipment of the plastics raw material characterized by having a roller pump, a gear pump, or a magnet pump, and having a revolving-speed-control means to

control the flow rate of a plastics raw material by the rotational frequency of the aforementioned motor for a pump drive, as the aforementioned control-of-flow means as the aforementioned feeding means in the restoration equipment of the plastics raw material of a claim 12-17 given in any 1 term.

[Claim 19] Restoration equipment of the plastics raw material characterized by having the pump which was with the piezoelectric device as the aforementioned feeding means in the restoration equipment of the plastics raw material of a claim 12-17 given in any 1 term, and having the piezoelectric-device control means controlled by the voltage or frequency which impresses the flow rate of a plastics raw material to the piezoelectric device of the aforementioned pump as the aforementioned control-of-flow means.

[Claim 20] Restoration equipment of the plastics raw material characterized by having a batching-by-volume formula pump and having the plunger control means which control the flow rate of a plastics raw material by the period of the plunger of the aforementioned pump of operation as the aforementioned control-of-flow means as the aforementioned feeding means in the restoration equipment of the plastics raw material of a claim 12-17 given in any 1 term.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the restoration method of the plastics raw material at the time of carrying out casting molding of the plastics, such as a plastic lens, and restoration equipment.
[0002]
[Description of the Prior Art] About the restoration method of the conventional plastics raw material, the restoration method of a plastic-lens raw material is taken up and explained to an example. First, the mould 14 for molding as shown in drawing 10 is formed. Positioning maintenance is carried out in the state where lens molding side 2a of the glass mold 2 which specifies the field by the side of lens molding side 1a of the glass mold 1 which specifies the field by the side of the body of a plastic lens, and an eyeball was made to counter with a predetermined interval. The mould 14 for molding is formed by twisting an adhesive tape 3 around the perimeter of both glass-mold peripheral faces 1b and 2b 1 round or more ranging over peripheral face 1b of a glass mold 1, and peripheral face 2b of a glass mold 2 in this state. in addition -- being alike -- as shown in drawing 11 , it inserts in the gasket 16 with an inlet so that lens molding side 2a of the glass mold 2 which specifies the field by the side of lens molding side 1a of the glass mold 1 which specifies the field by the side of the body of a plastic lens, and an eyeball may counter, and the method of forming the mould 14 for molding is also used the restoration method of a plastic-lens raw material is indicated by JP,10-264179,A, comes out, and shows the outline typically to drawing 12 It precedes injecting the plastic-lens raw material 5 into the cavity 4 in the mould 14 for molding, and the tip width 18 between lens molding side 1a of a glass mold 1 and lens molding side 2a of a glass mold 2 is measured. Next, the compressed air overheated by the position of an adhesive tape 3 by the air heater is sprayed, and the pouring hole 12 is made. The pouring needle 17 is inserted in the pouring hole 12 which was able to be made, and the plastic-lens raw material 5 is poured in. At this time, the pouring pattern of the plastic-lens raw material 5 is determined based on the tip width between the molding sides of the glass mold measured previously. The conventional pouring pattern is as being shown in the flow chart of drawing 13 , classifies a tip width into four and distributes it to four patterns. It asks for the minimum capacity of the cavity in the inside of the model which corresponds to the classified tip width from the capacity and tip width data of a cavity for every model which were database-ized, and a plastic-lens raw material is filled up with the pouring pattern shown in drawing 14 . First, if it pours in by the 2nd flow rate (small flow rate) fewer than the 1st flow rate and a full detection means operates after the 1st carries out time pouring of the plastic-lens raw material by the 1st flow rate (large flow rate), supply of a raw material will be stopped. The amount in which the 1st carries out time pouring by the 1st flow rate is set up so that the minimum capacity of the cavity for which it asked may not be exceeded. It is devised so that the amount of overflow after the cavity 4 was filled with making the 2nd flow rate small from the plastic-lens raw material 5 may serve as the minimum. Control of a flow rate is performed by controlling the amount of openings of the needle 20 of a needle valve 19, and a valve seat 21 attached in the pouring needle 17 upper part. Based on the selected pouring pattern, instructions go to a linear actuator 22, and the amount of openings is controlled by moving a needle 20 up and down. Supply of the plastic-lens raw material 5 is pressurizing the plastic-lens raw material

in a pressurized container 23 by the compressed air, and is sent to a needle-valve 19 side via a filter 24 and the piping 25 for feeding. A cavity 4 sucks up the raw material overflowed at the moment of [hole / pouring / 12] being filled with the plastic-lens raw material 5 with the vacuum suction nozzle 26. It judges that the inside of a cavity 4 was filled with detecting the plastic-lens raw material 5 attracted by the electrostatic-capacity form sensor 28 formed in the middle of piping which connects the vacuum generator 27 with the vacuum suction nozzle 26 from the plastic-lens raw material 5, a needle valve 19 is closed, and supply of the plastics raw material 5 is stopped. Then, by applying UV hardening resin to the pouring hole 12, and irradiating ultraviolet rays, UV hardening resin solidifies and the pouring hole 12 is closed.

[0003]

[Problem(s) to be Solved by the Invention] The restoration method of the conventional plastic-lens raw material has the following technical problems.

1. In the mould for becoming [the same pouring pattern] molding, a big difference arises in an injection time.
2. The liquid level of a plastic-lens raw material is undetectable through a form block or an adhesive tape.
3. An injection time will be prolonged by viscosity elevation of a plastic-lens raw material.
4. The plastic-lens raw material which carried out deaeration processing is pressurized.
5. Precision control of a needle valve is required.

[0004] The 1st technical problem is having the fault hundreds of kinds of moulds for molding which can be distributed to the same pouring pattern existing, there being a case of cavity capacity a flow rate's changing, in the mould for molding near the maximum capacity when pouring in a half about, time pouring in by the 2nd flow rate fewer than the 1st flow rate becoming long since the difference of the minimum capacity and maximum capacity is large, and a result injection time's becoming long. In order that, as for this, the combination of the glass mold of two sheets which forms the mould for molding may exceed thousands of kinds, the plastic lens for astigmatism reform is because the glass-mold molding side which specifies the field by the side of an eyeball turns into a toric side and a tip width changes with measurement parts, and even if it is the same tip width, many things from which the capacity of a cavity differs will exist.

[0005] Since the 2nd technical problem had only a means to detect the oil level of a raw material directly to detect the liquid level of a plastic-lens raw material conventionally, a super-thin detector machine is required for the mould for molding whose tip width is about 1mm, and it is that there is a danger that the inserted detector machine contacts the molding side of a glass mold, and gives a blemish. Furthermore, since the glass mold has curvature and cannot insert a detector machine deeply into a cavity, if the response of the flow rate change after liquid level detection is not good, before a flow rate will change, it may become full and a raw material may overflow. Moreover, when detecting the liquid level of a plastics raw material directly, the hole for liquid level detector machines besides a pouring hole is required for an adhesive tape, and in order to have to close a raw material together with the pouring hole after restoration, it has the demerit that the amount of the binder used at the time of sealing of a hole will also increase.

[0006] The method of supplying a raw material because the 3rd technical problem pressurizes the plastic-lens raw material in a pressurized container by the compressed air is that will cause a flow rate fall by increase of pressure loss if the viscosity of a plastic-lens raw material rises, and the position which changes from the 1st flow rate to the 2nd flow rate because the 1st flow rate and the 2nd flow rate become less than the flow rate of an aim shifts caudad, and an injection time is prolonged. The conventional pouring pattern is considered on the assumption that the pouring flow rate of a plastics raw material aims and it is supplied as a value. However, viscosity elevation starts a plastics raw material because a polymerization advances gradually with the time progress after preparation. Consequently, the pouring flow rate fall of a plastic-lens raw material takes place, the criteria cycle time of equipment is exceeded, and productivity falls. When an example was given and a trial calculation is made by the 4th pouring pattern mentioned as the example of JP,10-264179,A, an injection time will be prolonged by the injection time by 1.7 times by 1.42 times and 30% fall of a flow rate in

20% fall of a flow rate. In order to cancel this phenomenon, the flow rate at the time of viscosity elevation must be surveyed, a setup of the amount of needle-valve openings must be changed, and it becomes the factor of a man day rise. However, since the viscosity of a plastic-lens raw material rises gradually, setting change of the amount of openings cannot become a radical solution.

[0007] Although deaeration processing is performed in advance in order that a plastic-lens raw material may suppress generating of the foam at the time of polymerization hardening, a foam is generated by air in a raw material at the time of penetration and polymerization hardening, and the 4th technical problem is with the cause of a yield fall, and a bird clapper, when a plastic-lens raw material is pressurized by the compressed air for a long time. Moreover, time until it exhausts the plastic-lens raw material included in the pressurized container is restrained, and when it exceeds, deaeration processing is needed again.

[0008] The control is very severe although the 5th technical problem is performing change control of a pouring flow rate by controlling the needle of a needle valve, and the interval of a valve seat. For example, a 30cps plastic-lens raw material will change a flow rate also a second in 0.4cc /only by changing the interval of a needle and a valve seat 0.01mm. Therefore, the work which sets up a predetermined flow rate takes time, and the preparatory-work time at the time of equipment starting becomes long. Moreover, since the position control of a highly precise needle is required, an expensive needle valve and the linear actuator for control are needed.

[0009] Then, this invention can aim at shortening of an injection time, and aims at offering the restoration equipment of the plastics raw material in which the improvement in the yield and initial cost reduction of equipment are possible.

[0010]

[Means for Solving the Problem] Restoration of a plastics raw material consists of five processes, and at the 2nd process, the restoration method of the plastics raw material of this invention detects the liquid level of the plastics raw material under pouring, and changes and controls the flow rate of the plastics raw material supplied based on the detected liquid level by the 3rd process. In order that the liquid level detection means may be arranged at the position near the pouring hole and may change a flow rate in the position, it can shorten time until time to pour in by the 1st flow rate (large flow rate) becomes long and the inside of a cavity is filled up with a plastics raw material from the conventional method, and its productivity improves. Moreover, if a pouring flow rate is changed after detecting liquid level, and predetermined time passes, shortening of the further pouring time will be attained. Even if a pouring flow rate decreases by viscosity elevation of the plastics raw material supplied temporarily, since height with a liquid level detection means is poured in by the 1st flow rate (large flow rate), pouring time does not extend to it sharply. Although the liquid level detection means has clung to fixed height in order to simplify an equipment configuration, it can also change the height detected according to the size of the mould for molding for shortening of pouring time.

[0011] The plastics raw material has the different spectral characteristic from the member which constitutes the mould for molding. Therefore, to the member which constitutes the mould for molding, it is the wavelength region where permeability is high. And a floodlighting means A to irradiate the beam of light which includes the low wavelength region of permeability to a plastics raw material at the mould for molding If a liquid level detection means to have a light-receiving means A for it to be arranged at the side which faces the aforementioned floodlighting means A, and to detect light income change of the beam of light of the aforementioned wavelength region is used, change of the permeability produced by the existence of the raw material in a cavity can be detected, and the liquid level of a result plastics raw material can be detected. While this method can detect the liquid level of a raw material through the member which constitutes the mould for molding, the highly precise liquid level detection which did not receive the influence of the curvature of a form block or thickness, but was stabilized is possible for it. Moreover, even if it is with the liquid level detection means which doubles and has a light-receiving means B to detect the quantity of light change in the boundary section of the floodlighting means B and plastics raw material

which irradiate a beam of light to the mould for molding, and the air in a cavity, the liquid level of a plastics raw material is detectable. In the method of detecting the quantity of light change in the boundary section of a plastics raw material and the air in a cavity, and detecting the liquid level of a plastics raw material, when detecting through a form block, the variation in some is produced in detection height with the curvature of a form block. On the other hand, when detecting through an adhesive tape, although there is no variation in detection height, it needs to make distance of an adhesive tape and a detector machine regularity. However, since the detector machine in which both have the light source of a light region can be used, it becomes possible to be cheap and to constitute. If an example is given, the floodlighting means A will point out the laser beam irradiation device which emits light in the UV irradiation device or infrared radiation which emits light in ultraviolet rays, and the light-receiving means A will point out the light-receiving device which detects quantity of light change of ultraviolet rays or infrared radiation. Moreover, the floodlighting means B points out the irradiation device which uses as the light source Light Emitting Diode which emits light in a visible ray, and the light-receiving means B points out the light-receiving device which detects quantity of light change of a visible ray. If the liquid level detection method of the above-mentioned plastics raw material is used, since the liquid level of the plastics raw material in a cavity is detectable through the member which constitutes the mould for molding, the flexibility of installation of a liquid level detector machine is high, and all the matters that became a technical problem by direct detection of the oil level of a plastics raw material can be canceled. However, the member by which the beam of light for detecting the liquid level of a plastics raw material among the members which constitute the mould for molding is irradiated must be the transparent body or the translucent body which the aforementioned beam of light penetrates.

[0012] Change control of the pouring flow rate of a plastics raw material A raw material is supplied with a roller pump, a gear pump, or a magnet pump. How to control the flow rate of a plastics raw material by controlling the rotational frequency of the motor for a drive of the aforementioned pump, How to control the flow rate of a plastics raw material by controlling the voltage or frequency which supplies a raw material and is impressed to the aforementioned piezoelectric device with the pump which was with the piezoelectric device, A raw material is supplied with a batching-by-volume formula pump, and it carries out with either of the methods of controlling the flow rate of a plastics raw material by controlling the period of the plunger of the aforementioned pump of operation. Since these methods are methods which send in a plastics raw material directly, even if viscosity elevation of a plastics raw material breaks out, since there is very little reduction of a pouring flow rate and there is also little stretch of time until the inside of a cavity is filled up with a plastics raw material, productivity does not fall. Moreover, since it is the method which does not pressurize a plastics raw material by the compressed air, the foam which air is not made to melt into the plastics raw material which carried out deaeration processing, and is generated during hardening can be prevented, and it contributes to the improvement in the yield. Furthermore, management of a raw material also becomes easy by restrictions being lost at time until it exhausts a plastics raw material, and a make lump of a preparation raw material is also possible. Moreover, since a pouring flow rate can set up arbitrarily, supply by the optimal flow rate is attained according to the configuration and capacity of a cavity. In order to perform change control of a flow rate by the feeding device side moreover, since the pouring bulb should just have the function to perform only opening and closing of a valve, it does not need to use an expensive bulb like before, and its control equipment.

[0013] Therefore, the restoration method according to claim 1 is set to the cast-molding method of a plastic. The 1st process which supplies a plastics raw material, and the 2nd process which detects the liquid level of a plastics raw material, It is characterized by the bird clapper from the 3rd process which changes and controls the flow rate of the plastics raw material supplied based on the detected liquid level, the 4th process which detects that the inside of a cavity fills with a plastics raw material, and the 5th process which stops supply of a plastics raw material after detecting ****.

[0014] The restoration method according to claim 2 is set to the restoration method of a

plastics raw material according to claim 1. moreover, the 2nd process of the above The beam of light which is the wavelength region where permeability is high, and includes the low wavelength region of permeability to a plastics raw material to the member which constitutes the mould for molding is irradiated at the mould for molding. By detecting permeability change of the beam of light of the aforementioned wavelength region by the side which faces [irradiation and], it is characterized by detecting the liquid level of a plastics raw material.

[0015] Moreover, the restoration method according to claim 3 is characterized by detecting quantity of light change produced in the boundary section of a plastics raw material and the air in a cavity, and detecting the liquid level of a plastics raw material, when the 2nd process of the above irradiates a beam of light at the mould for molding in the restoration method of a plastics raw material according to claim 1.

[0016] Moreover, the restoration method according to claim 4 is characterized by the liquid level detection method of the 2nd process of the above changing the height detected according to the size of the mould for molding in the restoration method of a plastics raw material according to claim 2 or 3.

[0017] Moreover, it is characterized by the restoration method according to claim 5 being the transparent body with which the member which constitutes the mould for molding and, by which a beam of light is irradiated in the restoration method of the plastics raw material of a claim 2-4 given in any 1 term lets the beam of light for detecting the liquid level of a plastics raw material pass, or the translucent body.

[0018] Moreover, the restoration method according to claim 6 is characterized by the 2nd process of the above detecting the liquid level of the plastics raw material in a cavity through the member which constitutes the mould for molding in the restoration method of the plastics raw material of a claim 2-5 given in any 1 term.

[0019] Moreover, the restoration method according to claim 7 is characterized by 3rd changing [process] and controlling the flow rate of the plastics raw material supplied after predetermined time progress after detecting liquid level, as soon as the liquid level of a plastics raw material is detected by the process at the 2nd process of the above of the above in the restoration method of the plastics raw material of a claim 1-6 given in any 1 term.

[0020] Moreover, it is characterized by changing and controlling the flow rate of the plastics raw material which the 1st process of the above supplies a plastics raw material with a roller pump, a gear pump, or a magnet pump in the restoration method of the plastics raw material of a claim 1-7 given in any 1 term in the restoration method according to claim 8, and the 3rd process of the above is controlling the rotational frequency of the motor for a drive of the aforementioned pump, and is supplied.

[0021] Moreover, it is the restoration method of the plastics raw material characterized by to change and control the flow rate of the plastics raw material which is controlling the voltage or the frequency to which a plastics raw material's is supplied and the 3rd process of the above impresses it to the piezoelectric device of the aforementioned pump, and supplies by the pump with which the 1st process of the above had a piezoelectric device, and it was in the restoration method according to claim 9 in the restoration method of the plastics raw material of a claim 1-7 given in any 1

[0022] Moreover, it is characterized by changing and controlling the flow rate of the plastics raw material which the 1st process of the above supplies a plastics raw material with a batching-by-volume formula pump in the restoration method of the plastics raw material of a claim 1-7 given in any 1 term in the restoration method according to claim 10, and the process of the above 3 is controlling the period of the plunger of the aforementioned pump of operation, and is supplied.

[0023] Moreover, the member from which the aforementioned plastics raw material is a plastic-lens raw material, and restoration equipment according to claim 11 constitutes the aforementioned mould for molding in the restoration method of the plastics raw material of a claim 1-10 given in any 1 term is characterized by the bird clapper from the form block which specifies the field by the side of the body of an adhesive tape and a plastic lens, and the form block which specifies the field by the side of an eyeball.

[0024] Moreover, restoration equipment according to claim 12 is set to the cast-molding

equipment of a plastic. A feeding means to supply a plastics raw material, and a liquid level detection means to detect the liquid level of a plastics raw material, A control-of-flow means to change and control the flow rate of the plastics raw material supplied based on the detected liquid level, It is characterized by having a full detection means to detect that the inside of a cavity fills with a plastics raw material, and a valve-opening close means to receive the signal from a full detection means and to stop supply of a plastics raw material.

[0025] Restoration equipment according to claim 13 is set to the restoration equipment of a plastics raw material according to claim 12. moreover, the aforementioned liquid level detection means A floodlighting means A to irradiate the beam of light which is the wavelength region where permeability is high, and includes the low wavelength region of permeability to a plastics raw material to the member which constitutes the mould for molding at the mould for molding It is characterized by having a light-receiving means A for it to be arranged at the side which faces the aforementioned floodlighting means A, and to detect light income change of the beam of light of the aforementioned wavelength region.

[0026] Moreover, restoration equipment according to claim 14 is characterized by equipping the aforementioned liquid level detection means with a light-receiving means B to detect the quantity of light change in the boundary section of the floodlighting means B and plastics raw material which irradiate a beam of light to the mould for molding, and the air in a cavity in the restoration equipment of a plastics raw material according to claim 12.

[0027] Moreover, restoration equipment according to claim 15 is characterized by equipping the aforementioned liquid level detection means with the justification mechanism in which change ****** can do the height detected according to the size of the mould for molding in the restoration equipment of a plastics raw material according to claim 13 or 14.

[0028] Moreover, restoration equipment according to claim 16 is characterized by arranging the aforementioned liquid level detection means on the outside of the mould for molding so that the liquid level of the plastics raw material in a cavity can be detected through the member which constitutes the mould for molding in the restoration equipment of the plastics raw material of a claim 13-15 given in any 1 term.

[0029] Moreover, in the restoration equipment of the plastics raw material of a claim 12-16 given in any 1 term, the aforementioned control-of-flow means is constituted so that a flow rate may be changed and controlled in response to the detecting signal from the aforementioned liquid level detection means, and restoration equipment according to claim 17 is characterized by having the timer which detects the predetermined time progress from liquid level detection of a plastics raw material.

[0030] Moreover, restoration equipment according to claim 18 is characterized by having a roller pump, a gear pump, or a magnet pump, and having a revolving-speed-control means to control the flow rate of a plastics raw material by the rotational frequency of the aforementioned motor for a pump drive, as the aforementioned control-of-flow means as the aforementioned feeding means, in the restoration equipment of the plastics raw material of a claim 12-17 given in any 1 term.

[0031] Moreover, restoration equipment according to claim 19 is characterized by having the pump which was with the piezoelectric device as the aforementioned feeding means, and having the piezoelectric-device control means controlled by the voltage or frequency which impresses the flow rate of a plastics raw material to the piezoelectric device of the aforementioned pump as the aforementioned control-of-flow means in the restoration equipment of the plastics raw material of a claim 12-17 given in any 1 term.

[0032] Moreover, restoration equipment according to claim 20 is characterized by having a batching-by-volume formula pump and having the plunger control means which control the flow rate of a plastics raw material by the period of the plunger of the aforementioned pump of operation as the aforementioned control-of-flow means as the aforementioned feeding means, in the restoration equipment of the plastics raw material of a claim 12-17 given in any 1 term.

[0033]

[Embodiments of the Invention] Although the restoration method of a plastic-lens raw material is mentioned as an example and explained about the gestalt of the operation of this invention to the following, this invention is not limited to the gestalt of the following

operation. The restoration method of the plastic-lens raw material of this invention The 1st process which is as being shown in drawing 1 and supplies a plastic-lens raw material, The 3rd process which changes and controls the flow rate of the plastic-lens raw material supplied based on the liquid level detected as the 2nd process which detects the liquid level of a plastic-lens raw material, It consists of the 4th process which detects that the inside of a cavity fills with a plastic-lens raw material, and the 5th process which stops supply of a plastic-lens raw material after detecting ****.

[0034] The main cross sections in the case of detecting the liquid level of a plastic-lens raw material through a glass mold in the liquid level detection method of this invention to drawing 2 are shown. Drawing 2 is in the state where the plastic-lens raw material 5 is injected into the cavity 4 in the mould 14 for molding formed of a glass mold 1, a glass mold 2, and an adhesive tape 3. You may use the gasket which has an inlet instead of an adhesive tape 3. The liquid level detector machine is attached so that an optical axis 6 may come to the position from which it separated from the passage of the plastic-lens raw material 5 below the pouring hole 12. The beam of light emitted from the projector 7 reaches an electric eye 8 the early stages of pouring through the air section in a glass mold 1 and a cavity 4, and a glass mold 2. If the liquid level of the plastic-lens raw material 5 goes up, the beam of light emitted from the projector 7 will reach an electric eye 8 through a glass mold 1, the plastic-lens raw material 5, and a glass mold 2. As an example, the spectral transmittance of a plastic-lens raw material, a glass mold, and an adhesive tape is shown in drawing 3 . The permeability of a plastic-lens raw material and a glass mold differs greatly in an infrared region (a 320nm - 400nm ultraviolet region and 1200nm, 1450nm, and 1600nm - 2700nm). Among these, a 320nm - 400nm ultraviolet region is a wavelength region of UV-A, if the ultraviolet rays of this wavelength region reach to dermis for a long time and wavelength continues being exposed to them every day, the fiber in dermis will denaturalize, the elasticity and flare of the skin are lost, the chromogenic cell further called melanocyte is activated, and aging of the skin, such as making silverfish and buckwheat dregs deep, is promoted. For aging prevention of the skin, and eyeball protection, the ultraviolet ray absorbent is added in the plastic-lens raw material. Therefore, different part light wave type from a glass mold is shown. The decline in the permeability in a wavelength region (1200nm, 1450nm, and 1600nm - 2700nm) is a value peculiar to a plastic-lens raw material. As for the beam of light emitted from the projector 7 which has the light source of said wavelength region, 90% or more reaches an electric eye 8 until the plastic-lens raw material 5 reaches the optical-axis height of a detector machine. However, if the plastic-lens raw material 5 reaches the optical-axis height of a detector machine, light will be absorbed with a plastic-lens raw material, and the light which reaches an electric eye decreases to about 10% about 50% in 1200nm and 1450nm wavelength region 0% in a 320nm - 400nm wavelength region in a 1600nm - 2700nm wavelength region. Change of this light income is measured and it judges whether the plastic-lens raw material 5 reached to the optical-axis height of a detector machine. Since the light of a wavelength region (300nm or less and 2700nm or more) will almost be absorbed by the glass mold and a beam of light does not attain it to an electric eye 8 irrespective of the existence of a plastic-lens raw material, detection of liquid level is impossible. Drawing 4 shows how to detect the liquid level of a plastic-lens raw material through an adhesive tape. Although drawing 3 showed the spectral transmittance of an adhesive tape and a plastic-lens raw material, permeability differs greatly almost like the case of a glass mold in an infrared region (a 320nm - 400nm ultraviolet region and 1200nm, 1450nm, and 1600nm - 2200nm). That is, if a plastic-lens raw material attains the beam of light emitted from the projector 7 which has the light source of said wavelength region to the optical-axis height of a detector machine like the case where the liquid level of a plastic-lens raw material is detected through a glass mold, light income will decrease. Change of this light income is measured and it judges whether the plastic-lens raw material 5 reached to the optical-axis 6 height of a detector machine. However, the difference of the permeability of an adhesive tape and a plastic-lens raw material is small compared with the difference of the permeability of a glass mold and a plastic-lens raw material, and since permeability is changed a little in the state of the paste of an adhesive tape, it is more desirable [the method of detecting the liquid level of a plastic-lens raw material through a

glass mold] for performing stable liquid level detection. The wavelength region of the beam of light mentioned above is a wavelength region for detecting the liquid level of a plastic-lens raw material, the wavelength regions of the light source used also in other plastics raw materials only differ, and the detection principle of liquid level is the same.

[0035] The 2nd liquid level detection method of a plastic-lens raw material detects quantity of light change produced in the boundary section of the air in a plastic-lens raw material and a cavity. The quantity of light which the beam of light emitted from the projector is refracted by the oil level of a plastic-lens raw material, and reaches to an electric eye changes. This light income change is detected and it judges that the oil level of a plastic-lens raw material reached to the optical-axis height of a detector machine. Since the beam of light with which the initial light income before a plastic-lens raw material reaches the optical-axis height of a detector machine was irradiated from the projector is refracted on the surface of a glass mold when detecting the liquid level of a plastic-lens raw material through a glass mold, it will change with the curvatures of a glass mold. Therefore, it is desirable to use the detector machine equipped with the external tuning function. An external tuning function is a function to memorize the light income at that time by giving a signal from the exterior to a detector machine, and relative comparison with the memorized light income and the light income which changed is performed. That is, it becomes detectable [which it was stabilized when carrying out relative comparison on the basis of the initial light income at that time, even if initial light income varied with the curvature of a glass mold]. Since a light region is sufficient as the wavelength of the light source of this detector machine, it also has the merit that cheap Light Emitting Diode can be used. The kind of detector machine may be which gestalt of the recursion reflection type using the penetrated type, the reflected type, and the reflector 13, as shown in drawing 2 , drawing 5 , and drawing 6 . Moreover, a detector machine can also detect the liquid level of a plastics raw material through an adhesive tape, as shown in drawing 4 and drawing 7 . However, since a reflex has a limit in detection distance, it needs the oil level to detect and the mechanism which keeps the distance of a light emitter and receiver constant to perform accurate detection.

[0036] It is an indispensable condition that the two above-mentioned liquid level detection methods are the transparent bodies or the translucent bodies which penetrate the beam of light for the glass mold and adhesive tape by which a beam of light is irradiated detecting the liquid level of a plastics raw material.

[0037] The basic composition of the supply means of the plastic-lens raw material which are the 1st of this invention and the 3rd process, and flow rate change control means is shown in drawing 8 . The plastic-lens raw material 5 by which deaeration processing was carried out after preparation is sent to the pouring bulb 10 via the possible feeding device 9 of control of flow. The feeding device 9 is controlled by the control-of-flow device 11. The case where a roller pump is used for below as an example of representation of a feeding device is described. Supply of a plastic-lens raw material is performed by the roller pump, and flow rate change control is performed by controlling the rotational frequency of the motor for a drive of the aforementioned pump. Since a roller pump is the method which sends out a plastic-lens raw material through a durable elasticity tube, even if there is viscosity elevation of a plastic-lens raw material, the flow rate of an aim is securable. The plastic-lens raw material has the property that polymerization reaction progresses gradually and viscosity rises with the time progress after preparation. Therefore, this method which is not influenced of viscosity change is a means very effective in securing the pouring flow rate of an aim and making restoration of a plastic-lens raw material complete in a cavity in time of an aim. Furthermore, in order not to pressurize a plastic-lens raw material by the compressed air, air does not melt into a plastic-lens raw material. Therefore, a yield fall can be prevented, without generating a foam during polymerization hardening. Furthermore, restrictions are lost at time until it exhausts a raw material, and a make lump of a preparation raw material becomes possible. Moreover, since a pump mechanical component does not touch a plastic-lens raw material directly, it has the advantage that washing becomes easy. When a gear pump and a magnet pump are used as a feeding device, configuration and the function are the same as that of a roller pump. However, although a gear pump and a magnet pump are inferior to a roller pump in respect of

washing nature since a plastics raw material touches a mechanical component, it has the merit said that retubing is unnecessary.

[0038] The pump using the piezoelectric device as a supply means of other plastic-lens raw materials is raised. This pump forms a diaphram by sticking the piezoelectric device of two sheets which has an electrode on both sides. When voltage is applied to this, elongation another side is a thing using the shrunken property, and a pump function is equipped with it by one piezoelectric device by combining with a check valve. If alternating voltage is impressed to this, a diaphram will vibrate the period. Control of a pouring flow rate is performed by controlling the vibration frequency of a diaphram by controlling the amplitude of a diaphram by changing voltage, or changing frequency. Moreover, the method which controls the flow rate of a plastics raw material by controlling the period of a plunger of operation is also held, using a batching-by-volume formula pump as a feeding means. The inside of a measuring chamber becomes negative pressure at the time of plunger retreat, the check valve by the side of IN opens this pump, and a plastic-lens raw material flows in in a measuring chamber. Next, it is the method which extrudes the plastic-lens raw material which a plunger moves forward, and the check valve by the side of OUT opens, and is in a measuring chamber. This method can secure a fixed flow rate, even if viscosity elevation of a plastic-lens raw material takes place, since capacity is measured. A flow rate becomes possible by changing the period of plunger longitudinal slide movement. The place which also makes these pumps an aim is the same as that of the illustrated roller pump, and are fall prevention of the productivity by stretch of the injection time which happens by viscosity elevation of a plastic-lens raw material, and prevention with a faulty foam which the pressurization by the compressed air of a plastic-lens raw material starts owing to.

[0039] As a method of detecting, the stable full detection can perform that the inside of the cavity which is the 4th process of this invention fills with a plastic-lens raw material, and the simple Prior art of composition is adopted.

[0040] As a means to stop supply of the plastics raw material which is the 5th process of this invention, it is with the bulb which performs only opening-and-closing control of a valve. In order that change control of a pouring flow rate may perform the supply means of a plastic-lens raw material using the control-of-flow device in the 3rd process, at this process, structure can use a simple and cheap bulb and contributes to reduction of the initial cost of equipment.

[0041] If the 1st process in this invention · the 5th process are combined, the pouring pattern shown in drawing 9 is realizable. First, pouring is started by the 1st flow rate (large flow rate), if the oil level of a plastic-lens raw material is detected, it will change to the 2nd flow rate (small flow rate), if it detects that a cavity fills with a plastic-lens raw material, the signal will be received, the valve of a pouring bulb closes, and a feeding means stops simultaneously. If it pours in by the pouring pattern of this invention, a pouring flow rate will be changed in predetermined height, without being influenced by the configuration and capacity of a cavity. Therefore, from the time of pouring in by the pouring pattern which can be found from the conventional minimum capacity, an injection time can be shortened overwhelmingly and the productivity of equipment improves. Moreover, even if a pouring flow rate falls by viscosity elevation of a plastics raw material, since height with a liquid level detection means is poured in by the 1st flow rate (large flow rate), pouring time will not extend to it sharply. Although based on performing the change of the pouring flow rate of a raw material in liquid level detection height, in order to shorten an injection time further, after detecting liquid level and predetermined time passes, you may change a pouring flow rate. Moreover, the liquid level detection means for detecting the liquid level of a plastics raw material can also change the height detected according to the size of the mould for molding. In addition, if a liquid level detection means is attached in the mechanism section which goes up and down a pouring bulb, liquid level detection can be performed in the fixed height on the basis of a pouring hole.

[0042] In addition, although this example explained the detail about the restoration method of a plastic-lens raw material, in the cast-molding method, the restoration method of this invention constituted from said five processes can expect the same effect also in other plastics in the manufacture method which fabricates by injecting a plastics raw material into the

cavity in the mould for molding.
[0043]
[Effect of the Invention] As explained above, by using the restoration method of the plastics raw material of this invention, and restoration equipment, large shortening of time until the time poured in by the 1st flow rate (large flow rate) is long and a cavity is filled up with a bird clapper is attained, and improvement in productivity of equipment can be realized. Furthermore, if a pouring flow rate is changed after detecting liquid level and predetermined time passes, shortening of the further pouring time will be attained. Moreover, even if a pouring flow rate decreases by viscosity elevation of the plastics raw material supplied temporarily, since height with a liquid level detection means is poured in by the 1st flow rate (large flow rate), pouring time does not extend to it sharply.
[0044] Liquid level detection of a plastics raw material irradiates the beam of light which is the wavelength region where permeability is high, and includes the low wavelength region of permeability to a plastics raw material to the member which constitutes the mould for fabrication at the mould for molding, and detects light income change by the existence of a plastics raw material. The highly precise liquid level detection of this method which did not receive the influence of the curvature of a form block or thickness, but was stabilized is attained. Furthermore, although the method of detecting quantity of light change produced in the boundary section of the air in a plastics raw material and a cavity, and detecting the liquid level of a plastics raw material produces the variation in some in detection height with the curvature of a form block, in order that a detector machine with the light source of a light region may use it, it becomes possible [it being cheap and constituting]. Since the liquid level of a plastics raw material is detectable by the two above-mentioned liquid level detection methods through the member which constitutes the mould for fabrication, the installation flexibility of a liquid level detector machine increases, and equipment can be simplified.
[0045] By using the pump in which control of flow is possible as a supply means of a plastics raw material, even if viscosity elevation of a plastics raw material breaks out, there is very little reduction in a flow rate, and it can prevent the fall of productivity. Moreover, since a pouring flow rate can set up arbitrarily, it becomes possible to supply a plastics raw material by the optimal flow rate according to the configuration and capacity of a cavity. Furthermore, in order not to pressurize the plastics raw material itself by the compressed air, the foam which air is not made to melt into the plastics raw material which carried out deaeration processing, and is generated during polymerization hardening can be prevented, and it contributes to the improvement in the yield. A make lump of a preparation raw material becomes possible by restrictions being lost at time until it moreover exhausts a plastics raw material.
[0046] Moreover, in order to perform change control of a flow rate by the feeding device side, an expensive bulb and an expensive control equipment become unnecessary.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The restoration method **** basic flow view of the plastics raw material of this invention.
[Drawing 2] The cross section showing the outline in the case of detecting the liquid level of the plastics raw material in this invention through a glass mold using a penetrated type detector machine.
[Drawing 3] Drawing showing the spectral transmittance of a plastic-lens raw material, a glass mold, and an adhesive tape.
[Drawing 4] The cross section showing the outline in the case of detecting the liquid level of the plastics raw material in this invention through an adhesive tape using a penetrated type detector machine.
[Drawing 5] The cross section showing the outline in the case of detecting the liquid level of the plastics raw material in this invention through a glass mold using the detector machine of a reflex.
[Drawing 6] The cross section showing the outline in the case of detecting the liquid level of the plastics raw material in this invention through a glass mold using the detector machine of a recursion reflex.
[Drawing 7] The cross section showing the outline in the case of detecting the liquid level of the plastics raw material in this invention through an adhesive tape using the detector machine of a reflex.
[Drawing 8] The basic block diagram showing the supply means and flow rate change control means of a plastics raw material of this invention.
[Drawing 9] Drawing showing the pouring pattern of this invention.
[Drawing 10] The cross section showing the composition of the mould 1 for fabrication.
[Drawing 11] The cross section showing the composition of the mould 2 for fabrication.
[Drawing 12] Drawing showing the outline of the conventional restoration method typically.
[Drawing 13] The flow chart view showing the processing which chooses the conventional pouring pattern.
[Drawing 14] Drawing showing the conventional pouring pattern.
[Description of Notations]
1 2 .... Glass mold
1a, 2a .. Lens molding side
1b, 2b .. Glass-mold peripheral face
3 ..... Adhesive tape
4 ..... Cavity
5 ..... Plastic-lens raw material
6 ..... Optical axis
7 ..... Projector
8 ..... Electric eye
9 ..... Feeding device
10 ..... Pouring bulb
11 ..... Control-of-flow device
12 ..... Pouring hole
13 ..... Reflector

14 ..... Mould for molding
15 ..... Light emitter and receiver
16 ..... Gasket with an inlet
17 ..... Pouring needle
18 ..... Tip width
19 ..... Needle valve
20 ..... Needle
21 ..... Valve seat
22 ..... Linear actuator
23 ..... Pressurized container
24 ..... Filter
25 ..... Piping for feeding
26 ..... Vacuum suction nozzle
27 ..... Vacuum generator
28 ..... Electrostatic-capacity form sensor

[Translation done.]